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EXAMINER	
SEVER, ANDREW T	

ART UNIT	PAPER NUMBER
2851	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/996,685	KWOK ET AL.	
	Examiner	Art Unit	
	Andrew T Sever	2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-69 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 35-39,68 and 69 is/are allowed.

6)☒ Claim(s) 1-34,40-42,44-51,53-60 and 62-67 is/are rejected.

7)☒ Claim(s) 43, 52,& 61 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 30 November 2001 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1 ☐ Certified copies of the priority documents have been received.

2 ☐ Certified copies of the priority documents have been received in Application No. _____ .

3 ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6 .
4) ☒ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

1. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

On page 3 of the specification a publication: "Kwok et al (H.S.Kwok et al, Applied Optics, Vol. 39, pp 168-172, 2000)" is cited as being prior art, however it was not included on applicant's IDS, nor was a copy of it supplied to the examiner. It is therefore not being considered by the examiner.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the specifically claimed structures of the light valves must be shown; for example the red and blue color filters (claim 11) covering alternating pixels of the light valve and the structure of light valves where the portioning is in the form of alternating tiles (claim 12) and alternating strips (claim 13) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

These structures are claimed in many places with different varieties depending on which colors the light valve handles for example claim 20 deals with cyan instead of claim 11's magenta. The applicant must show these structures in every alternate embodiment where the applicant has claimed a light valve with partitioning in order to modulate two or more colors.

Specification

3. The disclosure is objected to because of the following informalities: page 8 line 2 reads in part: "red light of both as- and p-polarization", it is believed this should read "red light of both s- and p-polarization".

Appropriate correction is required.

4. The disclosure is objected to because of the following informalities: specification is incomplete.

Appropriate correction is required.

The specification ends suddenly on page 12 line 6 with the word "which", it would appear that there is more to the specification then what has been filed. **Appropriate correction is required**.

Claim Rejections - 35 USC § 112

5. Claims 6, 10, 19, 28, 40, 44, 53, and 62 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 6, 10, 19, 28, 40, 44, 53, and 62 recite that the liquid crystal light valves comprise "active matrix silicon backplane microdisplays" A search of the prior art revealed that this is not a term of art and the specification does not teach what an "active matrix silicon backplane microdisplays" is. Further the specification does not teach that the invention described in the specification uses "active matrix silicon backplane microdisplays." It will be assumed for purposes of a prior art search that "active matrix silicon backplane microdisplays" are in fact silicon backplane liquid crystal displays such as those described by van Gelder et al. (US 2002/0159033 A1.)

Claim 40 would be allowable since it is dependent on allowable claim 35 if the 112 issues are corrected.

6. Claims 14, 15, 23, 24, 32, 33, 48, 49, 57, 58, 66, and 67 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specific structure of the light valve as claimed either with the color filters being fabricated onto the active matrix back plane directly or on the counter glass opposite to the active matrix back plane is not described in the specification. One with ordinary skill in the projector arts, would not necessarily understand the structure of the active matrix silicon back plane micro display to the detail necessary to make the claimed light valves with undo research and/or experimentation. These claims will not be examined on their merits since there is no drawing or written description of the claimed structures to guide the examiner in the prior art search.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-4 rejected under 35 U.S.C. 102(e) as being anticipated by Johnson et al. (US 6,183,091.)

Johnson teaches in figure 3 an optical system for projecting an image comprising: a light source (100 and 112 combined) which provides a nearly collimated beam of light, means for polarizing the light (114 and 115), means for rotating the polarization of the green light by 90 degrees while leaving the polarization direction of the magenta light unchanged (116), a polarizing beam splitter (118) that separates the green band of light

from the magenta light, an inherently mostly polarization independent dichroic beam splitter (125) for separating the magenta light into a blue and red beam of light that propagates these two beams in separate directions, three reflective liquid crystal light valves that reflect respectively red (133), green (123), and blue lights (127), and a projection lens (138) for projecting the combined red, green, and blue lights onto a screen. Johnson teaches in column 8 lines 40-54 that a glass spacer block (119) is used to insure the optical distance is the same for all 3 colors. Glass is chosen since it has an index of refraction that is "closely matched" to the other elements of the system; therefore inherently the polarizing beam splitter and dichroic beam splitter inherently are glass pieces as is commonly done by those with ordinary skill in the art and as claimed by the applicant in applicant's claim 2. Inherently the polarizing cube has a coating which is at 45 degree angle of incidence (as this is what is commonly done in the prior art and what geometrically is represented in Johnson's drawings) that transmits p-polarized light (designated by quotation marks next to the transmitted light color (G")) and reflects s-polarized light (designated by the degree sign (M°)) as is claimed by applicant's claim 3. As shown in figure 3 the dichroic beam splitter reflects red color light of both s- and p-polarizations as is claimed by applicant's claim 4.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al. (US 6,183,091) as applied to claims 1-4 above.

As described in more detail above, Johnson teaches an optical system for projecting an image comprising a light source, means for converting most of the light into polarized light, means for rotating the polarization direction of a band of green light while maintaining the polarization direction of the magenta light, a polarizing beam splitter that separates the green light from the magenta light, a mostly polarization independent dichroic beam splitter that separates the magenta light into blue and red beams of light, three reflective liquid crystal light valves for imaging each of the colors, and a projection lens for projecting the combined red, green, and blue lights onto a screen. Johnson further teaches that the dichroic beam splitter is able to reflect red color light of both s- and p-polarizations instead of blue color of both s- and p-polarizations. However it is well known to one skilled in the art that a blue reflective dichroic filter can be easily substituted for a red reflective dichroic filter. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a blue

reflective dichroic filter in Johnson's dichroic beam splitter instead of a red reflective dichroic filter and reverse the appropriate light valves.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al. (US 6,183,091) as applied to claims 1-4 above in view of van Gelder et al. (US 2002/0159033 A1).

As described in more detail above, Johnson teaches an optical system for projecting an image comprising a light source, means for converting most of the light into polarized light, means for rotating the polarization direction of a band of green light while maintaining the polarization direction of the magenta light, a polarizing beam splitter that separates the green light from the magenta light, a mostly polarization independent dichroic beam splitter that separates the magenta light into blue and red beams of light, three reflective liquid crystal light valves for imaging each of the colors, and a projection lens for projecting the combined red, green, and blue lights onto a screen. Johnson however does not necessarily teach that the crystal light valves can be a silicon back plane micro displays which as nearly as can be discerned is claimed by applicant's claim 6.

US Patent Application Publication to van Gelder et al, teaches in paragraph 7 that a silicon back plane reflective LCD (liquid crystal on silicon or LCoS) panel are increasingly popular for use in applications such as compact projectors. These LCoS display panels have significant advantages over other types of reflective LCD panels, in that crystalline silicon can be used to form active matrix elements of the panels as well as functional circuitry through well-known and efficient semiconductor manufacturing

teehniques. Moreover, a larger percentage of the active area can be used for processing video information for display. Therefore it would have been obvious to one of ordinary skill in the art to use liquid crystal on Silicon (silicon back plane light valves) for Johnson's refleetive light valves given all the advantageous to LCoS displays taught by van Gelder et al.

12. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al. (US 6,183,091) as applied to elaims 1-4 above further in view of Hirose et al. (US 6,176,586.)

As deseribed in more detail above, Johnson teaches an optical system for projecting an image comprising a light source, means for converting most of the light into polarized light, means for rotating the polarization direction of a band of green light while maintaining the polarization direction of the magenta light, a polarizing beam splitter that separates the green light from the magenta light, a mostly polarization independent dichroic beam splitter that separates the magenta light into blue and red beams of light, three refleetive liquid crystal light valves for imaging each of the colors, and a projection lens for projecting the combined red, green, and blue lights onto a screen. Johnson, however, does not teach the use of a green filter to enhance the color purity of the green light and to balance the colors of different channels.

Hirose et al. In figure 2 teaches an optical system having a light source (1), a polarization converter (3) which converts blue and green light to one polarization orientation and red light to another, and refleetive light valves (301, 302, and 303). Hirose further teaches a green filter (603) to further filter the green band of light, in order

to trim the band of light being used to make a purer green. Accordingly it would have been obvious to one of ordinary skill in the art at the time of the invention to place a green filter to further filter the green band of light in Johnson's optical system in order to trim the band of light being used by the green reflective light valve, in order to make a purer green light image.

13. Claims 8-10, 17-19, and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson et al. (US 2002/0027619 A1).

Robinson teaches in figure 1 an optical system for projecting an image which comprises a light source (110), a means for converting most the light into polarized light (120), means for rotating the polarization direction of one spectral band of visible light by 90 degrees while leaving the polarization direction of the other spectral bands of visible light unchanged (130), a polarizing beam splitter (140) that separates the first spectral band of light from the rest of the light, and two reflective liquid crystal light valves that reflect respectively the first spectral band of light (160) and the other spectral bands of lights (150), which are taught in paragraph 10 to be reflective liquid crystal on silicon (LCoS) as nearly as can be understood is claimed by applicant's claims 10,19, and 28, and a projection lens (180) for projecting the combined lights onto a screen. Inherently the polarizing cube has a coating, which is at 45 degree angle of incidence (as this is what is commonly done in the prior art and what geometrically is represented in Robinson's drawings) that transmits p-polarized light and reflects s-polarized light as is claimed by applicant's claim 9, 18, and 27.

Robinson does not specifically designate what color each spectral band of light is in his first embodiment. Robinson teaches in paragraph 30 and 31 that for a different embodiment an active polarization rotator is used which works much like a color wheel in that the band of light receiving a change in polarization from the remaining two bands changes during time; that one useful color combination is that of the first band being green and the second being magenta (blue + red) (as is claimed by applicant's claim 8). Other color combinations are red and Cyan as is claimed by applicant's claim 17, and blue and yellow as is claimed by applicant's claim 26. Since Robinson teaches using the color combinations of green and magenta, red and cyan, and blue and yellow; at least for a temporary period, one with ordinary skill in the art at the time the invention was made would be motivated and able based on the second embodiment of Robinson, to make the first embodiment be such that it has two reflective liquid crystal light valves that reflect respectively green and magenta colored lights as is claimed in applicant's claim 8, cyan and red as is claimed in applicant's claim 17, and yellow and blue as is claimed by applicant's claim 26, using commonly polarization rotators and filters for the specific colors (for green and magenta the rotator would be such that it rotates the green band of light, for cyan and red; one that rotates red, and for blue and yellow; one that rotates blue) for a particular embodiment of the present invention.

14. Claims 11-13, 20-22, and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson et al. (US 2002/0027619 A1) as applied to claims 8-10, 17-19, and 26-28 above, and further in view of Owen et al. (US 6,464,359)

As described in more detail above Robinson teaches an optical system for projecting an image comprising, a light source, means for converting most of the light into polarized light, means for rotating the polarization direction of a band of green light in the first embodiment, red in the second, and blue in the third, a polarizing beam splitter that separates the band of light that has had its polarization rotated from the other bands of light and passing the rotated band in a direction orthogonal to that of the other bands, two reflective liquid crystal light valves which are LCoS which reflect green, or red, or blue and magenta or cyan or yellow light (1st, 2nd, and 3rd embodiments respectively), and a projection lens means for projecting the combined magenta and green lights onto a screen. Robinson, however does not teach the structure of the second light valve (magenta in the first embodiment, cyan in the second, and yellow in the third), specifically that it is partitioned into pixels with red and blue color filters covering alternating pixels (or in the second embodiment green and blue and in the third; red and green filters) as is claimed in applicants' claim 11 (1st embodiment), 20 (2nd embodiment), and 29 (3rd embodiment.)

When using a single light valve for more then one color it is well known to partition the structure into pixel with color filters over alternating pixels. An example is taught by Owen et al. in figure 5 which consists of alternating tiles as is claimed in applicant's claims 12, 21, and 30, and in figure 7 which consists of alternating strips as is claimed in applicant's claims 13, 22, and 31. Although Owen's partitioned light valve is for a light valve which reflects all 3 colors, one with ordinary skill in the art at the time the invention was made would be able to apply the teaching of Owen to a 2 color light

valve (such as the magenta light valve of applicant's claim 11), which as is well known in the art waste less light then 3 color light valve. Therefore since tiling a light valve that reflects multiple eolor bands of light such as taught by Owen is well known to use color filters either in a tile pattern or cylindrical pattern (which are chosen largely based on the lenticular lens available for pixelating the light to be modulated by the light valve), it would have been obvious to one of ordinary skill in the art at the time the invention was made to use color filters either in a cylindrical pattern or tiled pattern to partitioned the magenta (eyan or yellow) light valve into its two eomponent colors in Robinson's optical system as is elaimed by applicant's claims 11, 20, and 29.

15. Claims 16, 25, 34, 41, 42, 44-47, 50, 51, 53-56, 59, 60, and 62-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson et al. (US 2002/0027619 A1) in view of Owen et al. (US 6,464,359) as applied to claims 11-13, 20-22, and 29-31 above, and further in view of Hirose et al. (US 6,176,586)

Robinson in view of Owen as described in more detail above teaches an optical system for projecting an image comprising, a light source, means for converting most of the light into polarized light, means for rotating the polarization direction of a band of green light in the first embodiment, red in the second, and blue in the third, a polarizing beam splitter that separates the band of light that has had its polarization rotated from the other bands of light and passing the rotated band in a direetion orthogonal to that of the other bands, two reflective liquid erystal light valves whieh are LCoS which reflect green, or red, or blue and magenta or cyan or yellow light (1st embodiment as is claimed

in applicant's claim 41, 2nd embodiment as is claimed in applicant's claim 50, and 3rd embodiment as is claimed by applicant's claim 59), and a projection lens means for projecting the combined magenta and green lights onto a screen. Robinson in view of Owen teaches that the polarizing beam splitter comprises a polarizing cube with a coating designed at a 45 degrec angle of incidence that transmits p-polarized light and reflects s-polarized light as is claimed by applicant's claims 42, 51, and 60. Robinson in view of Owen teaches the light valves comprise silicon backplane microdisplays, as is believed to be claimed by the applicant's claims 44, 53, and 62, and that the structure of the second light valve (magenta in the first embodiment, cyan in the second, and yellow in the third), specifically that it is partitioned into pixels with red and blue color filters covering alternating pixels or in the second embodiment green and blue and in the third; red and green filters as is claimed by applicant's claims 45, 54, and 64 respectively. Further Robinson in view of Owen teaches that the pixelating of the second light valves is either in the form of alternating tiles as is claimed by applicant's claims 46, 55, and 64 or alternating strips as is claimed by applicant's claims 47, 56, and 65. Robinson in view of Owen does not teach, however, that the 2nd colored light (green, red, or blue in the first, second, or third embodiment) is further filtered by a color filter (green, red, or blue in the first, second, or third embodiment.)

Hirose et al. In figure 2 teaches an optical system having a light source (1), a polarization converter (3) which converts blue and green light to one polarization orientation and red light to another, and reflective light valves (301, 302, and 303). Hirose further teaches a green filter (603) to further filter the green band of light a red

filter (602) to further filter the red band of light, and a blue filter (601) to further filter the blue band of light, in order to trim the band of light being used to make a purer green, red, and blue image lights. Accordingly it would have been obvious to one of ordinary skill in the art at the time of the invention to place a green filter to further filter the green band of light, a red filter to filter the red band of light, or a blue filter to filter the blue band of light as appropriate (for applicant's claim 16, 25, and 34 respectively) in Johnson's optical system in order to trim the band of light being used by the green, red, or blue reflective light valve, in order to make a purer green, red, or blue light image.

Allowable Subject Matter

16. Claims 35-39, 68, and 69 are allowed.

17. The following is a statement of reasons for the indication of allowable subject matter:

With regards to applicant's claims 35-39, most of the components are found in Johnson and/or Robinson as described above. Specifically Johnson teaches a light source providing a near collimated beam of light, a polarizing beam splitter which transmits the light into two orthogonal directions, having orthogonal polarization directions, a polarization independent dichroic beam splitter that separates magenta light further into a blue and red beam, three reflective liquid crystal light valves that reflect respectively, red, green, and blue lights, and a projection lens means. Johnson, however, uses a means for rotating the polarization direction of a band of green light by 90 degrees while leaving the polarization direction of the magenta light unchanged in order to facilitate splitting the

green light from the magenta light, instead of placing pass filters after the polarized beam splitter. Although splitting non-polarized light with a polarized beams splitter is well known in the prior art, in general either one polarization is wasted or recycled or else six light valves are used to modulate each primary color in both polarization orientations. A third method is also often employed; that of a color wheel. The prior art did not reveal using the color pass filter after the PBS to differentiate the colors and therefore claims 35 are allowed. Claims 36-39 are dependent on claim 35 and are therefore also allowed.

With regards to applicant's claims 68 and 69, although single light valve projectors are well known in the art such as that taught by Owen et al. and van Gelder et al., the specific structure of having the color filters forming part of the construction of the reflective liquid crystal light valve was not found in the art. For example Owen teaches the color filter in figure 3 being disposed in front of the illuminating aperture (335) and polarizing beamsplitter (350.) Since claim 69 is dependent on claim 68 it is also allowed.

18. Claims 43, 52, and 61 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Clams 43, 52, and 61 claim a two reflective liquid crystal light valve optical system for projecting an image that has both a single color and a two color band pass optical filter instead of the one single color band pass optical filter taught by Robinson in view of Owen further in view of Hirose. Although Hirose teaches a color filter for each color, Hirose does not teach using a two color filter for one set of colors and a single

color filter for the third color light with the first filter being either magenta (claim 43), cyan (claim 52), or yellow (claim 61). Since this was not found in the prior claims 43, 52, and 61 would be allowable if written in independent form.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew T Sever whose telephone number is 703-305-4036. The examiner can normally be reached M-TH 8:30-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Russell Adams can be reached at 703-308-2847. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

AS
January 27, 2003

RUSSELL ADAMS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800